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### **Application of the NCRP Public Dose Limit for Ionizing Radiation**

#### **NCRP Statement No. 10, Issued \_\_\_\_\_, 2004**

The purpose of this Statement is to clarify the National Council on Radiation Protection and Measurements' (NCRP's) intentions regarding its public dose limit. The basis for the recommended dose limit is presented in the discussion of radiation protection goals and philosophy found in NCRP Report No. 116 (NCRP, 1993). However, the Council recognizes that application of the recommended dose limit for members of the public as discussed in Report No. 116 (NCRP, 1993) may require additional radiation protection judgments.

#### **Recommended Public Dose Limit**

As published in Report No. 116 (NCRP, 1993), the recommended annual radiation dose limit for individual members of the public from all radiation sources other than natural background and the individual's medical care is:

- For members of the public who are exposed continuously or frequently, the recommended annual effective dose limit is 1 mSv<sup>1</sup>.
- On an infrequent basis a member of the public may receive more than 1 mSv. In those cases, the annual effective dose limit may exceed 1 mSv up to a value of 5 mSv.

This Statement further recommends that infrequent should refer to a justified exposure that is not likely to occur often in an individual's lifetime.

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### **Exceptions to the Recommended Limit**

NCRP appreciates that exceptions to the 1 mSv per year limit may be justified in some circumstances. Such exceptions are justified on the basis of significant benefit to those exposed or society as a whole. The following are examples of such exceptions:

- For workers who come into contact with a co-worker who is a radionuclide therapy patient, the annual effective dose limit of 1 mSv may be exceeded under carefully controlled conditions for a small number of such workers who may receive up to 5 mSv annually (NCRP, 1995).
- For adult family members exposed to a patient who has received radionuclide therapy, the annual effective dose limit is 50 mSv (NCRP, 1995). Thus, adult family members under this circumstance are considered separate from other members of the public. In this event, the adult family members should receive appropriate training and individual monitoring (NCRP, 1995).
- Another example is the inadvertent irradiation of a stowaway in a cargo container irradiated with a pulsed fast neutron analysis (PFNA) system to assess the contents of the container. NCRP has recommended that PFNA systems be designed and operated in a manner such that the exposure of a stowaway would result in an effective dose less than 1 mSv for that occurrence. However, an effective dose up to 5 mSv would be permissible for such an occurrence if necessary to achieve national security objectives (NCRP, 2003a).

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### Source Controls

In 1984, NCRP published a statement on the control of air emissions of radionuclides from facilities that utilize radioactive materials (NCRP, 1984). In that statement, NCRP commented on the regulation of individual sources to assure that no individual member of the public would receive a continuous radiation dose above the 1 mSv per year limit. The intent of the recommendation in the 1984 statement was to address the involuntary radiation exposure from multiple sources of radiation to a large group of people.

The current advice in NCRP 116 (NCRP, 1993) states: “In the application of the Council’s recommendations to sources irradiating members of the public, the overriding considerations are those of JUSTIFICATION and ALARA. Normally, application of these two principles will insure that individuals are adequately protected. However, the NCRP reaffirms its previous recommendations (NCRP, 1984) that whenever the potential exists for exposure of an individual member of the public to exceed 25 percent of the annual effective dose limit as a result of irradiation attributable to a single site, the site operator should ensure that the annual exposure of the maximally exposed individual, from all man-made exposures (excepting that individual’s medical exposure), does not exceed 1 mSv on a continuous basis. Alternatively, if such an assessment is not conducted, no single source or set of sources under one control should result in an individual being exposed to more than 0.25 mSv annually.”

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1       It is reasonable to assume that involuntary exposure to radionuclides in air emissions  
2       from a site would be frequent and perhaps continuous for those who live near the site.  
3       Therefore, application of the recommended source control of 0.25 mSv annual effective  
4       dose per site is appropriate in this case. However, radiation exposure from many other  
5       sites is infrequent and in many instances voluntary or balanced by a requisite benefit to  
6       the individual. For example, exposure of an individual member of the public to scattered  
7       radiation in the waiting room of a radiology facility is infrequent for a given individual.  
8       A shielded facility designed to achieve an effective dose of no more than 1 mSv per year  
9       to the maximally exposed individual member of the public provides adequate protection  
10      in such a case. Arguably, a few employees of the radiology facility, who are not  
11      classified as radiation workers, may be exposed more frequently (*e.g.*, a receptionist). In  
12      this case, the site operator should assure that the effective dose received by such an  
13      individual does not exceed 1 mSv per year or should assess whether the individual should  
14      be classified as a radiation worker.

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16      Another example is the recent development in security screening technology that  
17      utilizes low-energy x-rays. This technology could result in large numbers of the public  
18      exposed to very low doses of radiation if the technology is implemented widely. NCRP  
19      has recommended that the exposure of members of the public from such x-ray systems  
20      used in security screening of humans should not exceed an administrative control of 0.25  
21      mSv per year at a given venue (NCRP, 2003b). Further advice for implementation of this  
22      administrative control is given in NCRP (2003b) for two categories of scanning systems:

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(1) general-use systems with effective doses per scan of 0.1  $\mu\text{Sv}$  or less, and (2) limited-use systems with effective doses per scan greater than 0.1  $\mu\text{Sv}$  and equal to or less than 10  $\mu\text{Sv}$  per scan.

This is a reasonable administrative control since the dose per scan from a general-use system is far less than 10  $\mu\text{Sv}$ , the NCRP negligible individual dose (NCRP, 1993). For limited-use systems, some form of record keeping might be necessary if the administrative control could be exceeded, and this is the responsibility of the facility using the system (NCRP, 2003b).

### **Conclusion**

NCRP acknowledges that there are public radiation exposure situations where it is necessary to use professional judgment when evaluating whether it is appropriate to apply the following recommendations in NCRP Report No. 116 (NCRP, 1993): (1) the 5 mSv per year value for infrequent exposures, and (2) a source control of 25 percent of the 1 mSv annual dose limit for members of the public. As indicated by the examples used in this Statement, such decisions must include consideration of individual and societal costs and benefits.

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### References

- NCRP (1984). National Council on Radiation Protection and Measurements. *Control of Air Emissions of Radionuclides*, NCRP Statement No. 6 (National Council on Radiation Protection and Measurements, Bethesda, Maryland).
- NCRP (1993). National Council on Radiation Protection and Measurements. *Limitation of Exposure to Ionizing Radiation*, NCRP Report No. 116 (National Council on Radiation Protection and Measurements, Bethesda, Maryland).
- NCRP (1995). National Council on Radiation Protection and Measurements. *Dose Limits for Individuals Who Receive Exposure from Radionuclide Therapy Patients*, NCRP Commentary No. 11 (National Council on Radiation Protection and Measurements, Bethesda, Maryland).
- NCRP (2003a). National Council on Radiation Protection and Measurements. *Pulsed Fast Neutron Analysis System Used in Security Surveillance*. NCRP Commentary No. 17 (National Council on Radiation Protection and Measurements, Bethesda, Maryland).
- NCRP (2003b). National Council on Radiation Protection and Measurements. *Screening of Humans for Security Purposes Using Ionizing Radiation Scanning Systems*. NCRP Commentary No. 16 (National Council on Radiation Protection and Measurements, Bethesda, Maryland).

### Footnote:

<sup>1</sup>The dose limit for an embryo-fetus given in the Public Dose Limits section of Table 1.1, in Section 10, and in Section 19 and Table 19.1 of Report No. 116 (NCRP, 1993) is for the case where a pregnant radiation worker is occupationally exposed. The dose limit for the embryo-fetus of a pregnant radiation worker is clearly stated in Section 19 (p. 54) of Report No. 116 (NCRP, 1993). Although not stated explicitly in Report No. 116 (NCRP, 1993), it should be understood that for the non-occupationally exposed pregnant woman, the embryo-fetus is adequately protected by the public dose limit.